HEAT EXCHANGER HAVING AN IMPROVED BAFFLE

FIELD OF THE INVENTION

The present invention relates generally to a heat exchanger and more particularly a multi-fluid heat exchanger, employing an improved baffle.

BACKGROUND OF THE INVENTION

In the automotive industry, in particular, it has become increasingly necessary to combine multiple functions in a single heat exchanger assembly. The need to reduce the number of overall components and to optimize assembly efficiency has driven the need for improved heat exchanger devices that combine increasingly efficient designs and multiple functions in packaging heretofore attainable using plural separate components or devices having inefficient designs. More specifically, there has been a growing need for an improved heat exchanger device, particularly for under the hood automotive vehicle applications, which combines multiple functions in a single assembly that is efficient to make and operate and that occupies substantially the same or less space than existing heat exchanger devices. Due to relatively recent advancements in the field, including, in particular, the development of combination heat exchanger assemblies or 'combo coolers', there is also a need to develop systems of more than one baffle to insure that multiple fluids be maintained basically separated from one another.

As stated above, particularly where a multi-fluid heat exchanger is to be employed, it is attractive to be able to maintain each of the different fluids of the exchanger separated from each other. The employment of baffles is one possible approach. However, until the present invention, baffle designs have often resulted in space problems, and the like, contributing to the loss of function or efficiency of one or more of the heat exchanger tubes. In particular, certain heat exchanger assemblies may have space requirements that extend to at least one core tube end in the tank. In such assemblies, space restrictions have led to 'rolling' of baffle perimeter walls or "flanges" that increase bonding against the tank perimeter and take up additional space that eventually restricts performance due to the fact that tube center to center

spaces can not be optimized. Furthermore, in multi-fluid heat exchanger assemblies, the solution has often been to insert, during assembly, at least two separate pieces, each providing a baffle, to form a so called double baffle. Often a first and a second baffle are assembled back to back.

Such a double baffle is in actuality, therefore, two baffles, as the two separate baffles have a space between the pieces to ensure that one fluid in the separate fluid systems remains separated from the other. To provide most effective functioning of such a system, it was found that a 'weep hole' must often be placed on the cover surface of the double piece double baffle, between the pieces of the double baffles, in order to let flux enter prior to brazing and to serve a potential leak detection function. This has caused a problem, however, since the two baffles need to be affixed in some manner to maintain their positions to perform their function, and positional control needs to be optimized to allow for reduced tube pitches, especially in higher performance heat exchanger assemblies applications. Thus, it would be especially desirable for an improved baffle design that can be incorporated into a heat exchanger, and particularly a multi-fluid heat exchanger, which makes efficient use of all heat exchanger tubes and solves this positional control problem.

SUMMARY OF THE INVENTION

The present invention is directed to a heat exchanger for an automotive vehicle. The heat exchanger includes a first end tank divided into a first portion and a second portion by a baffle. The heat exchanger also includes a plurality of a first tubes in fluid communication with the first portion of the first end tank, the plurality of first tubes configured to have a first fluid flow there through. Preferably, a plurality of second tubes are in fluid communication with the second portion of the first end tank, the plurality of second tubes configured to have a second fluid, different from the first fluid, flow there through. It is also preferable for the heat exchanger to include a plurality of fins disposed between the first tubes and the second tubes. Baffles may be used in single fluid or multifluid heat exchangers. In particular, in combo

coolers, a common tank section often needs a separator between the separate fluid systems. It has been found that a baffle, or, in particular, a double (or multiple) baffle system, can be used that provides the separation of fluids necessary for adequate functioning of heat exchange for each fluid. Preferably, in combination heat exchanger assembles or combo coolers, a one-piece double baffle may be used to ensure that the separate fluids of the multi-fluid systems remain essentially separated from one another.

Therefore, the present invention relates to a heat exchanger for an automotive vehicle having a heat exchanger tank and a baffle system, comprising: a first end tank divided into a first portion and a second portion by a baffle in the first end tank; a plurality of a first tubes in fluid communication with the first portion of the first end tank, the plurality of first tubes configured to have a first fluid flow therethrough; and a plurality of second tubes in fluid communication with the second portion of the first end tank. In preferred embodiments of the present invention, the plurality of second tubes in fluid communication with the second portion of the first end tank are configured to have a second fluid different from the first fluid, flow therethrough. The end tank further comprises a contact area having a deformation, perforation, slot or other shaped mating hole for a tab, wherein the baffle system comprises at least one one-piece double baffle, the one-piece double baffle including at least two baffle profiles and at least one tab; and each one-piece double baffle is disposed within the end tank and is folded so that the one-piece double baffle has baffle profiles that are roughly parallel to each other. The one-piece double baffle preferably comprises a tab at one section of its folded area. The end tank preferably has a perforation, slot or shaped mating hole for insertion of the tab of the one-piece double baffle. The tab may extend to the interior edge of the end tab or, preferably, the tab extends through the wall of the end tank, thereby securing its position and forming a seal. In preferred embodiments, the seal formed is essentially leak-tight.

The baffle system of the present invention includes a one-piece baffle, and, particularly, a one-piece double baffle, that can be easily assembled and provides a high level of positional control in order to allow for reduction in heat

exchanger tube core tube pitch. It is understood that a one piece baffle is essentially formed into one piece prior to assembly into the heat exchanger tank. In preferred aspects of the present invention, the one-piece double baffle is placed between adjoining tubes to separate the fluids. The space available for baffle placement is dependant on the tube spacing, or 'tube pitch' as it is also known. A reduction in tube pitch generally increases the performance of the heat exchanger, but provides less space for a double baffle. The present invention, by improving the positional tolerance of the double baffle on the end tank, allows more efficient allocation of the space to the function of the double baffle. Therefore, it is one objective of the present invention to have a one-piece double baffle that can be easily assembled and provide positive positional control to allow further reductions in the core's tube pitch.

In preferred embodiments of the present invention, a heat exchanger has a one-piece double baffle formed prior to assembly into the heat exchanger end tank. More preferably, the one-piece double baffle is formed from one continuous piece of material.

Preferably, the baffle system comprises at least one one-piece double baffle, and preferably, a one-piece double baffle formed preferably out of one piece of material and having at least two baffle profiles.

In a particular embodiment of the invention, a "hole" or "weep hole" may be placed on the cover surface between double baffles, to provide a communication towards the exterior. In an even more preferred embodiment, the entry passage is placed on the cover surface so as to enable entry of material, and particularly fluid materials such as flux, to prepare any wetted surfaces for brazing or the like. An additional preferred feature and advantage of such an embodiment is that said entry passage may also provide a means to facilitate leak detection. In preferred embodiments, the double baffle has an outer perimeter edge separated by a short distance to provide a relief channel at the sealing edge. Even more preferred is a sealing edge which is not 'rolled' or 'flanged', thus reducing the overall width of the

baffle between the tubes for shorter tube spacing. In a particularly preferred embodiment, the at least one profile of the double baffle is of a reduced thickness being assembled back to back with a common center contact portion area.

This at least one chamber is preferably formed in a bend, more preferably a bend of a U –type shape when viewed perpendicular to the end tank of each exchanger. In preferred embodiments, bends can be added to the basic U shape to allow for a more stable assembly. Additional bends can be added to fit into the space between adjacent tubes of each exchanger. It is preferable that at least one of the profiles of the one-piece double baffle matches or complements the shape of the end tank cross-section; it is more preferable that both profiles of the one-piece double baffle match the shape of the end tank cross-section. It has been found that by matching the shape of the end tank to the profile of the one-piece double baffle that a sealing surface may be formed when brazed.

Also, in preferred embodiments of the present invention, a heat exchanger tank has a one-piece double baffle for separating fluid sections that has perimeter walls that are approximately perpendicular to the tank wall surface. In more preferred embodiments, the perimeter walls of the baffle profiles have a common center portion or area and a chamber portion or area.

Also, in preferred embodiments of the present invention, a heat exchanger tank has a one-piece double baffle for separating fluid sections that has perimeter walls that are approximately perpendicular to the tank wall surface. In more preferred embodiments, the perimeter walls of the baffle profiles have a common center portion or area and a chamber portion or area.

In preferred embodiments of the present invention, the one-piece double baffle is folded in at least one section to form at least one projection or 'tab' that extends through a deformation, perforation, slot or other shaped mating hole in the end tank, thereby securing its position in

space and forming a seal. In more preferred embodiments, the at least one tab further comprises a relief means, for example, the at least one tab may be perforated in order to allow passage of fluid from the interior of the baffle or the baffle 'chamber', to the outside of the end tank in a sort of 'relief' function. The one-piece double baffle, in accordance with one aspect of the present invention, comprises at least two baffle profiles, the at least two baffle profiles having a common central portion and forming a chamber portion. The one-piece double baffle may have one or more tabs. Preferably, at least one tab of the at least one tabs has a relief means throughout its thickness. Also preferably, the at least one tab may have a relief means that is not throughout the thickness of the at least one tab, but wherein the end tank has a relief means at a point contiguous with the tab. In other preferred embodiments, two or more projections or tabs extend through deformations, perforations, slots or other shaped mating holes in the end tank. In certain embodiments, as described above, the tab may be perforated or even mechanically or otherwise removed after being inserted into the contact area of the tank. This removal may take place anywhere near, at, or above the interior edge of the tank, where such removal does not compromise the functioning of the heat exchanger assembly. In particular, after assembly of the tab and tank, the tab may be removed, and a relief means or hole formed, and, the profiles of the baffle remain in place, even with the relief means between the profiles at the area of the tab, and even if the profiles are separated by the relief means. Since the baffle has been stabilized at assembly to a sufficient degree to maintain its position as required to be utilized in heat exchanger applications, it will be clear to the man of ordinary skill in the art that further manipulations of the tab or other elements such as the shape or linear or non-linear essence of the relief means, are possible, and within the prevue of the present invention.

The present invention provides for a one-piece double baffle wherein the advantages of a multi-piece double baffle can be achieved by using only a one piece part. In addition to the functional advantages, in preferred embodiments a tab is formed and included as a part of the one-piece double

baffle, the tab securing the double baffle in place and preventing undesirable positional changes or movement of the one-piece double baffle as it goes through the steps of the overall heat exchanger assembly process.

Preferably, the one-piece double baffle provides a shape that can be held easily by tooling to allow the precise and automatic assembly into the end tank assembly. This shape, in addition to the need for only one part, allows for automatic assembly of the part. In particularly preferred embodiments of the present invention, a wider wall portion of a one-piece baffle beyond the tube walls extends and provides extra support to provide a stable base. This wider base allows the baffle to be constrained from rotating and allows the baffle to rest against a positive stop to ensure its full and correct assembly. The tab provides positive location for the baffle to be placed along the end tank's length.

Preferably, the one-piece double baffle is shaped to provide for ease of automatic assembly of the part. By providing for a portion of the one-piece double baffle to be of a particular width outside the tube walls, support is provided to create a stable base for the baffle in the finally assembled unit. In the preferred embodiments, the baffle, and, particularly, the tab, comprises a wall portion of significant width beyond the tube walls to provide such a support.

Preferably, the one-piece double baffle is made out of one piece of continuous material. Preferred materials for use in making the one-piece double baffle include metals or metallic materials, or alloys of such metals or metallic materials. More preferred are metals or metallic materials or alloys of such materials that can be employed in assembly processes using brazing processes. Most preferred are metals such as aluminum or aluminum alloys. It is also preferred that the one-piece double baffle be made from a flat or planar section or piece of material. In more preferred embodiments, a flat piece of metal is stamped or otherwise shaped, to form a one-piece double baffle with profiles having a short tab, located at a folded or bended region. In more preferred embodiments, the profiles of the one-piece double baffle are downwardly projecting in similar planes, in most preferred embodiments each baffle profile is approximately parallel to one another.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1. Elevational schematic side view of a one-piece double baffle in accordance with an aspect of the present invention.

Figure 2. Cross sectional view of a one-piece double baffle, with wide wall portion beyond the tubes walls, in accordance with an aspect of the present invention, assembled in a heat exchanger assembly core.

Figure 3. Isometric view of a one-piece double baffle, in accordance with an aspect of the present invention, prior to assembly with end tank.

Figure 4. Elevational view from outside the end tank of a one piece baffle in accordance with an aspect of the present invention, after assembly with end tank.

Figure 5. Elevational cross-sectional view of a one-piece double baffle from inside the end tank, in accordance with an aspect of the present invention, after assembly.

Figure 6. An elevational cross-sectional view of a one-piece double baffle with inwardly formed features on each baffle profile in accordance with an aspect of the present invention.

Figure 7. An elevational view of a one-piece double baffle with tabs added to each portion of the double baffle and inserted into slots on the opposing side of the end tank.

Figure 8. An elevational view of a one-piece double baffle with a connecting tab entirely within the end tank which is not inserted into a complementary mating hole on the heat exchanger tank, in accordance with an aspect of the present invention.

Figure 9. An elevational view of a one-piece double baffle with tabs added to each portion of the double baffle so that they insert into slots on the opposing side of the end tank and where a connecting tab is contained entirely within the end tank.

Figure 10. An elevational view from outside the end tank of a one piece baffle in accordance with an aspect of the present invention, after assembly with end tank where the relief means is located in the end tank.

Figure 11. An elevational cross sectioned view of a one-piece double baffle indicating positive stop or stabilizing capacity of the double baffle, in accordance with an aspect of the present invention.

Figure 12. An elevational cross-sectional view of a one-piece double baffle with differently formed features on each baffle profile in accordance with an aspect of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Generally, the present invention relates to a heat exchanger having a baffle system and to a method of forming the heat exchanger. The heat exchanger may be a single fluid or multi-fluid (e.g., 2, 3 or 4 fluid) heat exchanger. The heat exchanger may also be a single pass or multi-pass heat exchanger. Although the heat exchanger according to the present invention may be used for a variety of articles of manufacture (e.g., air conditioners, refrigerators or the like), the heat exchanger has been found particularly advantageous for use in automotive vehicles. For example, the heat exchanger may be used for heat transfer of one or more various fluids within a vehicle such as air or gasses, oil, transmission oil, power steering oil, radiator fluid, refrigerant, combinations thereof or the like. For example, in a highly preferred embodiment of the present invention there is contemplated a multi-fluid heat exchanger that includes an oil cooler or condenser in combination with a cooler selected from the group consisting of a power

steering oil cooler, a transmission oil cooler, a radiator fluid cooler and a combination thereof. In general, a preferred heat exchanger contemplates at least two spaced apart end tanks bridged together in at least partial fluid communication by a plurality of generally parallel tubes, with fins disposed between the tubes.

The present invention is further optimized by the employment of an improved double baffle and heat exchanger tubes, and the employment of a bypass or a combination thereof. Heat exchangers of the present invention will typically include one or more tubes, one or more end tanks, one or more inlets and outlets, one or more one-piece double baffles, one or more fins or a combination thereof. Depending upon the embodiment of the heat exchanger, various different shapes and configurations are contemplated for the components of the heat exchanger. For example, and without limitation, the components may be integral with each other or they may be separate. The shapes and sizes of the components may be varied as needed or desired for various embodiments of the heat exchanger. Additional variations will become apparent upon reading of the following description.

According to one aspect of the invention, one or more of the components of the heat exchanger such as the baffles, the end tanks, the tubes, the inlets, the outlets, a bypass or combinations thereof may be attached to each other using brazing techniques. In preferred embodiments of the present invention, profiles of the one-piece double baffle are formed whereby the end tank and baffle profile shapes provide for a sealing surface through a brazing process or technique. Although various brazing techniques may be used, one preferred technique is referred to as controlled atmosphere brazing. Controlled atmosphere brazing typically employs a brazing alloy for attaching components wherein the components are formed of materials with higher melting points than the brazing alloy. The brazing alloy is preferably positioned between components or surfaces of components to be joined and, subsequently, the brazing alloy is heated and melted (e.g., in an oven or furnace, and preferably under a controlled atmosphere). Upon cooling, the brazing alloy preferably forms a metallurgical bond with the components for attaching the components to each other. According to one highly preferred

embodiment, the brazing alloy may be provided as a cladding on one of the components of the heat exchanger. In such a situation, it is contemplated that the components may be formed of a material such as a higher melting point aluminum alloy while the cladding may be formed of a lower melting point aluminum alloy.

Referring to Figures 1 and 2, a one-piece double baffle forms a seal with the end tank in the area about the perimeter of 1 and form a baffle chamber 3 separating the functional areas of end tanks 4, 5 of a two or more pass assembly. The baffle of the present invention may be uniform (same or basically the same width of chamber throughout) or non-uniform in shape. In heat exchanger assemblies with reduced tube pitches, the one-piece double baffle is, preferably, non-uniform in shape.

Referring to Fig. 2, a portion of the one-piece double baffle is formed with an overall chamber width 10 between opposing profile sides 36 larger or, preferably, significantly larger at the area of the end tank than at the interior. A one-piece double baffle may be used in heater assembly cores 7 with reduced tube pitches 8. Tab 2 is formed so that it will fit into a perforation or hole 9 in the end tank 12 of the heat exchanger. In the preferred embodiments of Fig. 2, the tab is formed so that it will form a snug, leak-tight seal, and securely hold the one-piece double baffle 6 in position via the tab 2. In Figures 1, 2, 4 and 5, preferred embodiments show a perforation, slot or hole 13 from which fluid within the baffle chamber may escape from between the baffle sections 3 to the exterior of the end tank 15.

Referring to Fig 6, a one-piece double baffle 6 with inwardly formed feature(s) 16 on at least one side of the baffle profile so that the center(s) 17 contact forming a thicker wall 18 thickness.

Referring to Fig 7, at least one tab 19 added to each portion of the double baffle 6 so that they insert into at least one slot 20, 21 on the opposing side 22 of the end tank 12.

Referring to Fig 8, a connecting tab 23 is provided and may be within the tank.

Referring to Fig 9, at least one tab 19 added to each portion of the double baffle 6 so that the at least one tab can insert into at least one slot 20, 21 on the opposing side 22 of the end tank 12.

Referring to Fig 10, the relief means is a slot or hole 24 from which fluid within the baffle chamber may escape from between the baffle sections 3 to the exterior of the end tank 15 is located in the end tank 12.

Referring to Fig 11, the wider wall portion of the baffle 10 beyond the tube wall extends and provides extra support to provide a stable base. This wider base allows the baffle to be constrained from rotating and allows the baffle to rest against a positive stop to ensure its full and correct assembly. The tab 2 provides positive location for the baffle to be placed along the end tank's 12 length.

Referring to Figure 12, baffle profiles 46, 47, are different in form from one another, particularly in the common central area 48 of the baffle.

From the above, it will thus be appreciated that one preferred method of the present invention contemplates providing a heat exchanger assembled in a common assembly; passing a first fluid through one portion of the heat exchanger for heat exchange, and passing at least one fluid through at least one additional portion of the heat exchanger for heat exchange of the fluid.

From the above, it will thus be appreciated that in a particularly method of the present invention a multi-fluid heat exchanger is assembled in a common assembly; passing a first fluid through one portion of the heat exchanger for heat exchange, and passing at least one additional fluid

through at least one additional portion of the heat exchanger for heat exchange of the additional fluid.

Another advantage of the one-piece double baffle is that it can detect leaks across a flow dividing partition in a single fluid exchanger, in a condenser, for example.

Preferably, a heat exchanger in accordance with the present invention includes at least one one-piece double baffle for dividing a region within a component of a heat exchanger into two or more portions. The one-piece double baffle of the present invention may be provided in a variety of different shapes and having a variety of configurations depending upon which component of the heat exchanger the baffle is to be placed within and also depending, for instance, upon the configuration of that component.

According to one preferred embodiment, the portions separated by the one-piece double baffle are part of an internal opening within an end tank of the heat exchanger. According to a highly preferred embodiment, a one-piece double baffle is employed to separate the respective portions in a heat exchanger wherein each of the subdivided portions is adapted to receive the same fluid under different conditions, or different fluids. As to the latter, for example, one portion may receive a first fluid (e.g., a condenser fluid or the like) while the other portion receives a second fluid (e.g., a transmission oil or power steering oil), which is different from the first fluid. In this manner, the use of one-piece double baffles allows different fluids of a multi fluid heat exchanger to be maintained separate from each other as they flow through the heat exchanger. In a most preferred embodiment, the double baffle is a one-piece double baffle with a relief means.

It may be possible to achieve the desired resulting structure using any of a number of art-disclosed forming techniques. Particularly preferred methods start off with one continuous piece of material. For example, a coining, casting, machining or other suitable operation may be employed.

According to one preferred embodiment, the one-piece double baffle is formed by attaching (preferably, for example, with a weld, a braze, or a solder material, or the like) two substantially identical metal pieces, or, more preferably, taking a continuous piece of material , such as a sheet metal and folding it together in mirror symmetrical relation to each other.

Once formed, the double baffle 6 is installed within a heat exchanger, such as within the interior of an end tank. It will be appreciated that the peripheral surface 1 of the double baffle 6 preferably has a shape that complements the end tank, so that the peripheral surface is substantially engaged with the inner wall surface of the end tank about the peripheral surface, thereby facilitating sealing as desired between end tank subdivided portions. Optionally a seal or gasket is applied to the peripheral surface for assuring seal integrity.

Preferably, the double baffle 6 is positioned within an opening of the end tank to separate a first portion of the opening from a second portion of the opening. The first outer surface preferentially faces the first portion and the second outer surface faces the second portion.

In one highly preferred embodiment, though not required, the baffle or double baffle is adapted for providing leak detection or for otherwise assuring seal integrity. To do so, it is preferred that the end tank be provided with at least one relief means. During assembly, the baffle is positioned so that the relief means is substantially juxtaposed with the hole or channel of the baffle. In this manner, it will be appreciated that if there is a faulty seal between portions of the end tank, fluid from that portion will enter the channel and exit through the 'relief means'. The fact of a leak is then detectable by the fluid escape. The location of the faulty seal is also pinpointed by analyzing the escaped fluid to determine from which portion of the end tank it originated.

It is contemplated that various specific techniques may be used to secure the double baffle within the end tank. For example, the one-piece

double baffle 6 may be interference fit within the tank and seals (not shown) may be used to prevent passage of fluid past the double baffle 6. Alternatively, the double baffle 6 may be adhesively bonded at its peripheral surface 1 to the end tank. In a highly preferred embodiment, the outer peripheral surface of the double baffle 6 substantially corresponds to an inner surface of the end tank such that the outer peripheral surface and the inner surface substantially continuously oppose and contact each other.

Accordingly, the outer peripheral surface may be attached to the inner surface by welding, brazing soldering or the like. Advantageously, the double baffle 6 provides good resistance to pressures, or pressure fluctuations provided by fluids within the portions of the end tank, even in one-piece double baffles that include two plates integrated for reinforcing each other. Also advantageous, the double baffle 6 can provide fluid tight seals separated by the chamber since the outer peripheral surface is separated into portions by the chamber. Thus, each of the seals can buffer the other from pressure fluctuations thereby providing greater overall sealing between the portions of the end tank. The double baffles 6 are thus fit between tube entrances and exits to the end tank without interfering with flow of fluid through the tubes. The flexibility in mounting also helps to assure that the presence of dead tubes or other tube inefficiencies can be avoided.

Other embodiments of baffles other than the ones described above are also within the scope of the present invention, including but not limited to the additional preferred embodiments that are described in the following discussion. It should be understood that principles of operation and assembly of the embodiments described in the following are substantially identical to the one-piece double baffle 6 and end tank of Fig. 1, and the description of those general aspects applies also to the embodiments in the following discussion. Therefore, to avoid repetition, the description of the embodiments will focus more on unique structural features of the embodiments.

The present invention also provides methods method for making a heat exchanger tank assembly, one of the preferred methods comprising: manufacturing a one-piece double baffle comprising a tab at an area of insertion, fold or bend on the double baffle and with peripheral walls of the double baffle formed so that they form a central chamber; providing a heat exchanger end tank which comprises an contact area comprising a deformation, perforation, slot or other shaped mating hole for insertion of the tab of the double baffle; aligning the tab of the baffle and the end tank contact area so that the tab may be inserted into the contact area chamber; inserting the one piece double baffle in the end tank at the contact of the end tank; and applying a sealing technique such that the double baffle remains in place after the assembly process and the completed heat exchanger assembly may be used in automotive applications.

Generally, it is contemplated, and, in fact, expected, that various changes may be made to the preferred embodiments of the baffles and one-piece double baffles to accommodate different designs of heat exchangers while still remaining within the scope of the present invention. As an example, and referring to Fig. 7, there is illustrated another alternative one-piece double baffle 6 which has multiple tabs. Such a double baffle would preferable rest within an end tank of a heat exchanger. The double baffle 6 of Figure 9 preferentially includes an perforation or hole through a tab or tabs 19 and, thereby extending through a wall 20, 21 of the end tank 12.

As indicated previously, the baffles of the present invention are useful in a number of different applications. In one preferred use an end tank for a multi-fluid heat exchanger is provided and is subdivided with at least one-piece double baffle in accordance with the present teachings. In another embodiment, a one-piece double baffle as described herein is employed to subdivide an end tank of a single fluid heat exchanger. The present baffles need not be used only to subdivide end tanks, but may be used to subdivide any structure that provides a fluid passageway. In still another preferred embodiment, the peripheral walls spacing varies to a wider position beyond

the tube slot area (for example see Figure 2) in order to allow for a more stable base.

As described above, after assembly of the tank and tab, the tab many be removed, and a relief means formed near, at or above the interior edge 10 of the end tank 12.

The preferred embodiment of the present invention has been disclosed. A person of ordinary skill in the art would realize however, that certain modifications would come within the teachings of this invention. Therefore, the following claims should be studied to determine the true scope and content of the invention.

What is claimed is: